ACOUSTICS, LIGHT, AND HEAT

Acoustics, Light, and Heat. By William Lees, M.A., Lecturer on Natural Philosophy, the Heriot Watt College, and Lecturer on Mathematics and Experimental Physics, Free Church Training College, Edinburgh. New and Enlarged Edition. (London and Glasgow: Wm. Collins, Sons, and Co.)

THIS is one out of many of the text-books which have been called into existence by the "May" Examinations of the Science and Art Department. Being written especially to meet the requirements of the student who wishes to pass these examinations, it is only brought up to the standard given in the directory of the Department, and may therefore for this purpose be useful. The fact that a new and enlarged edition is now appearing is certainly evidence that this is the case. To make it more serviceable, the questions of all the May Examinations in Subject VIII. from 1872 to 1885 are given.

Though the simple and numerous diagrams and the generally clear nature of the text give it a certain value as a text-book, it is by no means so free from faults and ambiguities as might be expected in a new edition.

It may be well to refer especially to a few places where alterations suggest themselves.

Figs. 19 and 20 show the contrast between a musical sound and a noise. Though it is explained that "noises are due to irregular vibration or a confused mixture of musical sounds which produce aërial waves of great complexity and wanting in periodicity," no explanation is offered of a peculiarity in the "curve of a noise" (Fig. 20), which in three places is actually made to slope backwards.

Some of the figures in optics are rather wanting in precision. Thus in Fig. 73, which shows a real image formed by a concave mirror, a pair of slightly diverging rays are made to cross between the mirror and the principal focus. Again, Fig. 77 shows a caustic on the surface of milk in a glass with its cusp reaching close to the centre. Fig. 103 shows the action of a refracting plate on a beam of light by the turning and approximation of successive wave-fronts. Those two wave-fronts which obliquely cut the surface are shown straight and partly swung round, as if they were rigid lines meeting with resistance at one end. It would surely have been better to have bent the line at the point of intersection, leaving all the wave-fronts and parts of a front outside the medium parallel to one another, and also all inside parallel to one another, but it is possible that wave-fronts, strictly speaking, are not intended.

The explanation of so important a thing as the achromatic lens can hardly be considered satisfactory. Owing to its brevity it is possible to give this in full. "This defect in a lens [the defect of chromatic aberration] is obviated by the combination of a double convex lens of *crown* glass, with a convexo-concave of *flint* glass (Fig. 122). The effect of the second lens is to re-blend the coloured rays which the first has produced, and at the same time such an amount of refraction is preserved as to bring the light to a focus." As nowhere is it directly pointed out that for the same degree of refraction flint glass produces more dispersion than crown, it is not difficult to imagine that a student might fail to form any very clear idea of the principle of the achromatic lens, nor is he likely to be materially helped by the figure (122), which certainly does not represent either the section or any other view of any achromatic lens that was ever made. If it were not for the section lines it would be a good perspective drawing of a short cylinder; the ellipse which appears to be the end of such a cylinder is really meant to show the crown lens in section, and the figure of uniform thickness by its side, as thick everywhere as the ellipse is in the middle, which seems to be the side of the cylinder, is meant for the section of the flint lens. Simplicity in a diagram is a thing to be desired, but there is more than simplicity here.

Very little is said about spectrum analysis; and its application to the measurement of the motion of the heavenly bodies in the line of sight is not even mentioned.

The general weakness of the optical part is to a certain extent compensated for by the chapters on polarisation, which have much to recommend them. There is here, however, a paragraph which requires explanation. "Now it is found that whatever quantity of polarised light there is for any incidence *other than the polarising angle* in the reflected beam, there is always the *same* quantity in the refracted beam. At the polarising angle, however, the refracted beam exhibits traces of polarisation." What is meant by this distinction is by no means clear.

Heat is more precisely and clearly treated than light, but here the general excellence is marred by an example to illustrate expansion in which the working out of the result shows that the obvious meaning of the question is not intended. What any one would understand by the words, "Find the length of a rod of brass which would expand equally with a rod of steel 3 feet long under a change of temperature of 10° C.," is evidently—Find what length of brass will increase in length by the same amount that a 3-foot rod of steel does for a change of 10° C. But what is found in the working of the answer is the length of a piece of brass which will expand so as to be *as long as* a piece of steel 3 feet long when each is *raised* 10° C.

Sufficient has been said to show that this book is not as clear and accurate in either the text or the figures as might be expected in a new edition.

OUR BOOK SHELF

Cholera Curable. By John Chapman, M.D. (London: Churchill, 1885.)

DR. CHAPMAN has had the opportunity of testing, in the Hôpital de la Charité in Paris, his method of the so-called neuro-dynamic treatment in Asiatic cholera, and his demonstration of the success of this treatment constitutes, we take it, the cardinal motive for the production of this book, although a good many other, mostly theoretical, considerations are brought into the discussion.

The symptoms of Asiatic cholera are explained by a number of assumptions on the action of the spinal cord and the sympathetic nervous system, but as to which we look in vain for experimental proof. The theories concerning the etiology and causation of cholera are fully treated, and then Dr. Chapman promises to furnish us with a complete solution of these problems in a discovery made by him as to the cause of cholera. When, however, we come to analyse what he really has discovered,

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it turns out that he himself is moving in a circle of fallacies. While denying the specific nature of the cholera virus, he explains this latter by the symptoms of the disease. Assuming, for the sake of argument, with Dr. Chapman, the particular disturbances of function in the cord and the sympathetic nerves to which the symptoms of cholera are due, how does this bring us nearer to the knowledge of what causes these particular disturbances? By saying, or even by showing, that such and such a disturbance in the function of the cord and sympathetic causes such and such a symptom of disease, we are not one iota nearer the answer to the question, Why did such and such a disturbance take place? what has caused it? The answer to this one wants to know, but this is not supplied by Dr. Chapman. It is quite true that a great many conditions are required to favour the outbreak and spread of cholera, *e.g.* conditions of temperature, water, atmospheric disturbances, soil, &c., &c., but all these conditions may be present without producing cholera, or typhoid fever, or any other similar disease. Why? Because *the actual cause* of the disease is absent. These two things, viz. secondary conditions favouring the outbreak and spread, and *the actual cause*, must be kept separate; but evidently Dr. Chapman has not arrived at this as yet.

The chapters VIII. to XV. describe the various methods of treatment of the disease, and they form the most important part of the book. E. KLEIN

Seaweeds, Shells, and Fossils. By Peter Gray, A.B.S., and B. B. Woodward. (London: Swan Sonnenschein and Co

THE object of this book is to give to the young English collector a general knowledge how to set about collecting the more common seaweeds, shells, or fossils.

In the first case the subject is dealt with generally, classifying the different seaweeds and stating where each is most likely to be found, and, when found, the best way to press them and get them ready for the cabinet, the most economical way of making or obtaining which is given.

Secondly, shells are dealt with, descriptions and diagrams being added where necessary, together with a table of the more important genera, showing the approximate number of species belonging to each genus, and their distribution.

Thirdly, and lastly, different localities are pointed out where fossils are best found, and the best mode of arranging them in the cabinet. A table of the principal fossiliferous strata arranged in chronological order, with notes on the different formations mentioned in the table, and also of the principal divisions of the animal kingdom, are added to show the order in which the fossils should be arranged. S.

The Modernised "Templeton"; or, "The Practical Mechanic's Companion." By William Templeton. Revised and Modernised by Walter S. Hutton, C.E. (London: Crosby Lockwood and Co., 1886.)

TEMPLETON'S "Mechanic's Workshop Companion" is a work familiar to most mechanics and draughtsmen, having been considered for the last quarter of a century a useful book of reference by all connected with the management of engineering workshops and kindred trades. Books of this description require revising very often, and considering the enormous development of the mechanical sciences during the last few years no one will wonder on hearing that even "Templeton" has to be modernised to keep pace with the times.

The reviser tells us that he has endeavoured to follow as far as possible the lines of the original work, at the same time bringing all the information up to date. Much new matter has been added, giving information on air, gas, water, and steam; methods of testing steam-engines and boilers; turbines and other water motors; the strength and weights of material; and miscellaneous information too numerous to give in detail.

The work has for a frontispiece an illustration of the fine compound locomotive "The Marchioness of Stafford," designed by Mr. F. W. Webb, the able locomotive superintendent of the London and North-Western Railway. On seeing this we are at once led to imagine that at last we have found a book giving recent data on locomotive engineering, and likely to fill a want seriously felt by those who study that most interesting branch of mechanical engineering. We are told to "see p. 360," to which we turn hoping to find a section devoted to locomotive work, having Mr. Webb's fine engine as an example of the latest advance. We find a third of a page giving the bare dimensions of the compound. Even the index makes matters no better, for the book contains no locomotive data whatever! Considering the thousands of mechanics engaged in this class of work, this is a great pity, and should be remedied in a future edition.

An excellent abstract is given of the results of experiments on riveted joints, with special reference to practical work, by Prof. Alexander B. W. Kennedy. This is most interesting and useful, and will well repay careful study by those connected with the manufacture of soft steel boilers and bridges.

The book contains all the usual tables, embracing every subject likely to be required by the intelligent mechanic or draughtsman, including extensive practical rules and data. Instruction is also given in the rudiments of arithmetic, algebra, and trigonometry. N. J. L.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to insure the appearance even of communications containing interesting and novel facts.*]

Foreign Fishery Boards

IN reference to recent statements in NATURE on this subject, it will interest your readers to know that in Italy the Government has constituted a Fishery Board, which, my friend Prof. Giglioli, of Florence, tells me, is actively employed in advising the executive and in inquiring into the grievances and difficulties of fishermen, and the suggestions for improvement of fisheries; it has also recently, at the expense of the Government, taken practical measures in the stocking of lakes with fish, and in the cultivation of sea-fish. This Commission is a branch of the "Ministry of Agriculture, Industry, and Commerce," which corresponds to our Board of Trade. *The members of the Fishery Commission, with the exception of the first three named below, are exclusively scientific men.* They are as follows:—The Permanent Under-Secretary of State for Agriculture; the Permanent Under-Secretary of State for Commerce; a distinguished lawyer; M. Minni, of Venice; Dr. Renier, of Chioggia (representing the fishermen of this island); M. Friedlander, of Comacchio (specially acquainted with the peculiar fish-culture of this district); Prof. Giglioli, Florence: Prof. Targioni-Tozzetti, Florence; Prof. Costa, Naples; Prof. de Vincentis, Taranto; Prof. Canestrini, Padua; Prof. Pavesi, Pavia; Prof. Issel, Genoa.

The Commission meets from time to time in Rome. The questions submitted to it are brought forward and referred separately to one or two members, who are requested to draw up a report on the particular subject thus referred. The report may take several months, and involve experiment or research, or it may be a simple matter. The report when presented is discussed by the whole Commission. The conclusions and recommendations which it embodies are modified by vote of the majority, and it is obvious from the constitution of the Board that the scientific experts have the voting strength.

The members of the Board or Commission are paid travelling

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